

Stellwagen Bank National Marine Sanctuary

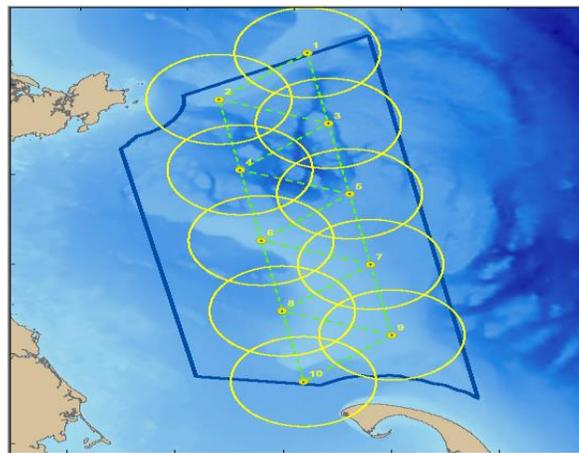
Acoustic Impacts to Resources

Management Issue

Increasing levels of human activity in coastal waters are accompanied by increasing levels of anthropogenic underwater sound. Many marine animals, including mammals, fish and invertebrates, use sound to communicate, navigate, feed and avoid predators, among other critical life functions. Impacts to resources in Stellwagen Bank National Marine Sanctuary (Sanctuary) due to underwater noise warrant attention and research.

Description

The level of ocean noise in the marine environment, its anthropogenic components and its impact on marine resources are national and international issues. The National Research Council has identified the potential for harm to marine organisms from excessive noise, and the need for information on the amount of sound introduced into the oceans by human activity as key scientific questions. As stewards of marine protected areas that host many species of marine animals that communicate using sound and are subjected to high levels of noise produced by human activities (e.g., chronic noise from vessel traffic), it is incumbent on the Sanctuary to investigate and understand this issue. Instrumentation, data collection, analysis techniques, mitigation designs and policy models developed at the Sanctuary can be used as a model for other sanctuaries.



Autonomous recording units are used to monitor underwater noise throughout the SBNMS. Image credit: SBNMS

Questions and Information Needs

- 1) What are the relative inputs of sound from various sources to the Sanctuary's total "ocean noise budgets", and how do they vary at temporal and spatial scales?
- 2) What are the temporal/spatial distributions of vocalizing marine animals in the Sanctuary?
- 3) Are changes in the behaviors of vocally-active marine animals relative to anthropogenic sound sources biologically significant, and how can this information inform underwater noise policy for the Sanctuary?
- 4) Are changes in the areas over which animals can detect signals, including communication signals, biologically significant, and how can this information inform underwater noise policy for the Sanctuary?
- 5) Can acoustic metrics predict differences in biological diversity among sanctuary habitats?

Scientific Approach and Actions

- Continuously monitor the Sanctuary's acoustic environment, particularly within low frequency bandwidths
- Integrate acoustic and vessel tracking data with other data regarding distribution of sound-producing activities
- Analyze acoustic data for presence/absence and/or localization of vocalizing marine animals
- Integrate acoustic and non-acoustic habitat predictor variables in multivariate model based on sanctuary's high resolution datasets
- Use and develop analytic techniques to combine temporally specific geospatial data sets (e.g., animal behavior, bottom topography, prey fields and received levels of sound)

Key Partners and Information Sources

NOAA Fisheries Northeast Fisheries Science Center, Cornell University, Woods Hole Oceanographic Institution, Massachusetts Division of Marine Fisheries, Mystic Aquarium, National Parks Service

Sanctuary Resources Available

- Research vessel
- Acoustics expertise
- Some types of acoustic recording equipment operated at reduced costs through research collaborations to pilot techniques and memorandums of understanding with partners both within and outside NOAA

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For More Information -- <http://www.sanctuaries.noaa.gov/science/assessment>

- Data from other ongoing research projects (e.g., AIS vessel tracks) that can be combined with acoustic data to create a more complete understanding
- GIS analysis to support soundscape predictive modeling effort

Resource Needs

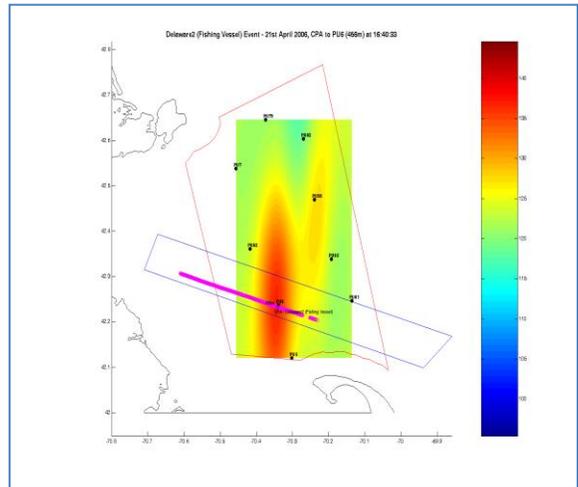
- Financial support: all project costs (including some personnel costs) are funded by grants

Management Support Products

- Descriptive statistics regarding relative inputs of noise within the Sanctuary from various sources, including variation in time and space
- Descriptive statistics regarding distributions of vocally-active marine animals, including variation in time and space
- Identification of potential mitigation actions and associated socioeconomic impacts
- Case studies for noise management and biodiversity assessment outside marine protected areas and/or lessons for marine protected area design.

Planned Use of Products and Actions

- Inform stakeholder communities regarding how animals use and human activities influence the underwater acoustic environment
- Solicit user input for management strategies to reduce anthropogenic noise in the sanctuary
- Work with appropriate partners to develop mitigation policies



*Acoustic footprint produced by a cargo ship transiting the Sanctuary, with red denoting higher intensity noise, and the pink dots showing the track of the ship.
Credit: SBNMS*

Program References

SBNMS Management Plan

- Reduce marine mammal behavioral disturbance and harassment by noise (MMBD.2).
 - (2.1) Establish a Marine Noise Consortium to identify noise sources and possible effects.
 - (2.2) Develop a marine acoustics research program to establish baseline noise levels and long-term noise budgets.
 - (2.3) Develop a policy framework for investigating and mitigating noise impacts within SBNMS.

SBNMS Condition Report

- What are the levels of human activities that may influence living resource quality and how are they changing?

ONMS Performance Measures

- Expand observing systems and monitoring efforts within and near national marine sanctuaries to fill important gaps in the knowledge and understanding of ocean and Great Lakes ecosystems
- Investigate and enhance the understanding of ecosystem processes through continued scientific research, monitoring, and characterization to support ecosystem-based management in sanctuaries and throughout U.S. waters.

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